CLAIMS

WHAT IS CLAIMED IS:

1. A method of fabricating a semiconductor device comprising the steps of:
   a) forming a non selective N type buried layer comprising a first majority dopant having a first coefficient of diffusion; and
   b) forming a selective P type buried layer comprising a second majority dopant having a coefficient of diffusion greater than said first coefficient of diffusion.

2. The method set forth in claim 1 wherein the step of forming said non selective N type buried layer is performed before the step of forming said selective P type buried layer.

3. The method set forth in claim 1 wherein the step of forming said selective P type buried layer is performed before the step of forming said non selective N type buried layer.

4. The method set forth in claim 1 wherein the step of forming said selective P type buried layer includes the step of controlling the amount of said second majority dopant relative to the amount of said first majority dopant such that said selective P type buried layer over compensates said non selective N type buried layer completely throughout said non selective N type buried layer

in a region where said selective P type buried layer is formed.

5. The method set forth in claim 1 wherein the step of forming said selective P type buried layer includes the step of controlling the amount of said second majority dopant relative to the amount of said first majority dopant such that said selective P type buried layer does not completely over compensate said N type buried layer throughout said non selective N type buried layer in a region where said selective P type buried layer is formed.

6. The method set forth in claim 1 wherein the step of forming said non selective N type buried layer includes the step of selecting said first majority dopant from one of arsenic or antimony and the step of forming said selective P type buried layer includes the step of selecting boron for said second majority dopant.

7. The method set forth in claim 1 wherein the step of forming said selective P type buried layer includes the step of controlling the amount of said second majority dopant relative to the amount of said first majority dopant such that said selective P type buried layer has a maximum dopant concentration greater than the maximum dopant concentration of said non selective N type buried layer.

8. The method set forth in claim 1 further including the steps of:

a) forming an N type layer on said non selective N type buried layer; and

b) forming a P well extending from said selective P type buried layer through said N type layer.

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9. The method set forth in claim 8 in which ~~the~~ dopants from the N type and P type buried layers diffuse into the N type layer.

10. The method set forth in claim 9 in which the dopants of the P type buried layer extend further into the N type layer than do the dopants of the N type buried layer.

11. The method set forth in claim 8 wherein the step of forming said P well includes the step of controlling the amount of a majority dopant used in forming said P well relative to the amount of said first majority dopant such that the maximum majority dopant concentration of said non selective N type buried layer is greater than the maximum majority dopant concentration of said P well.

12. The method set forth in claim 1 wherein the step of forming said selective P type buried layer

includes the steps of implanting and diffusing said second majority dopant.

13. The method set forth in claim 12 further including the additional step of forming an epitaxial layer on said selective P type buried layer after the step of implanting said second majority dopant.

14. The method set forth in claim 13 wherein the step of forming said epitaxial layer is performed before the step of diffusing said second majority dopant.

15. The method set forth in claim 14 wherein the step of diffusing said first majority dopant includes the step of controlling said diffusion such that said second majority dopant up diffuses into said epitaxial layer.

16. The method set forth in claim 12 further including the steps of:

a) forming an N type layer on said non selective N type buried layer; and

b) forming a P well extending from said selective P type buried layer through said N type layer.

17. The method set forth in claim 16 wherein the step of forming said N type layer is performed before the step of diffusing said second majority dopant.

18. The method set forth in claim 17 wherein the step of forming said P well includes the step of controlling the amount of a majority dopant used in forming said P well relative to the amount of said first majority dopant such that the maximum majority dopant concentration of said non selective N type buried layer is greater than the maximum majority dopant concentration of said P well.

19. The method set forth in claim 1 wherein

a) the step of forming said non selective N type buried layer includes the steps of implanting and diffusing said first majority dopant; and

b) the step of forming said selective P type buried layer includes the steps of implanting and diffusing said second majority dopant.

20. The method set forth in claim 19 wherein the steps of implanting and diffusing said first majority dopant are performed before the steps of implanting and diffusing said second majority dopant.

21. The method set forth in claim 19 further including the additional step of forming an epitaxial layer on said selective P type buried layer after the step of implanting said second majority dopant.

22. The method set forth in claim 21 wherein the step of forming said epitaxial layer is performed before the step of diffusing said second majority dopant.

23. The method set forth in claim 22 wherein the step of diffusing said first majority dopant includes the step of controlling said diffusion such that said first majority dopant up diffuses into said epitaxial layer.

24. The method set forth in claim 21 wherein the step of forming said epitaxial layer is performed before the step of diffusing said first majority dopant.

25. The method set forth in claim 24 wherein the step of diffusing said first majority dopant includes the step of controlling said diffusion such that said first majority dopant up diffuses into said epitaxial layer.

26. A method of fabricating a semiconductor device in a wafer comprising the steps of:

a) implanting across all of said wafer an N type dopant having a first coefficient of diffusion and at a first dose level;

b) diffusing said N type dopant into said wafer to form an N type buried layer;

c) masking a portion of said wafer;

d) implanting into said wafer in areas not masked a P type dopant having a coefficient of diffusion greater than said first coefficient of diffusion; and

e) diffusing said p type dopants into said wafer to form a P type buried layer.

27. The method set forth in claim 26 wherein the step of implanting said N type dopant is performed before the step of implanting said P type dopant.

28. The method set forth in claim 26 wherein the step of implanting said P type dopant is performed before the step of implanting said N type dopant.

29. The method set forth in claim 26 wherein the step of implanting said P type dopant includes the step of controlling the amount of said P type dopant relative to the amount of said N type dopant such that said P type buried layer has a maximum dopant concentration greater than the maximum dopant concentration of said N type buried layer.

30. The method set forth in claim 26 further including the steps of:

a) forming an N type layer on said N type buried layer; and

b) forming a P well extending from said P type buried layer through said N type layer.

31. The method set forth in claim 30 wherein the step of forming said N type layer is performed before the step of diffusing said P type dopant.

32. The method set forth in claim 31 wherein the step of forming said P well includes the step of controlling the amount of a majority dopant used in forming said P well relative to the amount of said N type dopant such that the maximum majority dopant concentration of said N type buried layer is greater than the maximum majority dopant concentration of said P well.

33. The method set forth in claim 26 wherein the steps of implanting and diffusing said N type dopant are performed before the steps of implanting and diffusing said P type dopant.

34. The method set forth in claim 26 further including the additional step of forming an epitaxial layer on said P type buried layer after the step of implanting said P type dopant.

35. The method set forth in claim 34 wherein the step of forming said epitaxial layer is performed before the step of diffusing said P type dopant.

36. The method set forth in claim 35 wherein the step of diffusing said N type dopant includes the step of controlling said diffusion such that said N type dopant up diffuses into said epitaxial layer.

37. The method set forth in claim 34 wherein the step of forming said epitaxial layer is performed before the step of diffusing said N type dopant.

38. The method set forth in claim 37 wherein the step of diffusing said N type dopant includes the step of controlling said diffusion such that said N type dopant up diffuses into said epitaxial layer.

39. The method set forth in claim 26 wherein the step of implanting said N type dopant includes the step of selecting said N type dopant from one of arsenic or antimony and the step of implanting said P type dopant includes the step of selecting boron for said P type dopant.

40. A method of fabricating a semiconductor device in a wafer comprising the steps of:

a) growing an epitaxial layer doped with an n type dopant having a first coefficient of diffusion and a first doping level to form an N type buried layer;

b) masking a portion of said wafer;

c) implanting into said wafer in areas not masked a P type dopant having a coefficient of diffusion greater than said first coefficient of diffusion; and

d) diffusing said p type dopants into said wafer to form a P type buried layer.

41. The method set forth in claim 40 wherein the step of implanting said P type dopant includes the step of controlling the amount of said P type dopant relative to the amount of said first doping level such that said P type buried layer over compensates said N type buried layer completely throughout said N type buried layer in a region where said P type buried layer is formed.

42. The method set forth in claim 40 wherein the step of implanting said P type dopant includes the step of controlling the amount of said P type dopant relative to the amount of said first doping level such that said P type buried layer has a maximum dopant concentration greater than the maximum dopant concentration of said N type buried layer.

43. The method set forth in claim 40 further including the steps of:

a) forming an N type layer on said N type buried layer; and

b) forming a P well extending from said P type buried layer through said N type layer.

44. The method set forth in claim 43 wherein the step of forming said P well includes the step of controlling the amount of a majority dopant used in forming said P well relative to the amount of said first doping level such that the maximum majority dopant concentration of said N type

buried layer is greater than the maximum majority dopant concentration of said P well.

45. The method set forth in claim 40 further including the step of forming a second epitaxial layer on said N type buried layer.

46. The method set forth in claim 45 wherein the step of forming said second epitaxial layer is performed before the step of diffusing said P type dopants.

47. The method set forth in claim 40 wherein the step of growing an epitaxial layer includes the step of selecting said N type dopant from one of arsenic or antimony and the step of implanting includes the step of selecting boron for said P type dopant.

48. A method of fabricating a semiconductor device in a wafer comprising the steps of:

a) bonding a device wafer doped N type to a first doping level with a dopant having a first coefficient of diffusion to a handle wafer by insulator bonding and separating a desired thickness of said device wafer to form an SOI layer which is also an N type buried layer;

b) introducing P type dopants having a second coefficient of diffusion greater than said first coefficient of diffusion in a selected

region of said SOI layer to form a P type buried layer;

c) forming an epitaxial layer on the surface of said SOI layer; and

d) diffusing so that the P type dopants extend up into said epitaxial layer further than the N type dopants in said SOI layer.

49. The method set forth in claim 48 wherein the step of introducing said P type dopants includes the step of controlling the amount of said P type dopants relative to the amount of said first doping level such that said P type buried layer over compensates said N type buried layer completely throughout said N type buried layer in a region where said P type buried layer is formed.

50. The method set forth in claim 48 wherein the step of introducing said P type dopants includes the step of controlling the amount of said P type dopants relative to the amount of said first doping level such that said P type buried layer has a maximum dopant concentration greater than the maximum dopant concentration of said N type buried layer.

51. The method set forth in claim 48 further including the steps of forming a P well extending from said P type buried layer through said epitaxial layer.

52. The method set forth in claim 51 wherein the step of forming said P well includes the step of controlling the amount of a majority dopant used in forming said P well relative to the amount of said first doping level such that the maximum majority dopant concentration of said N type buried layer is greater than the maximum majority dopant concentration of said P well.

53. The method set forth in claim 48 wherein the step of bonding includes the step of selecting the N type dopant from one of arsenic or antimony and the step of introducing P type dopants includes the step of selecting boron for said P type dopants.

54. A method for forming an N+ buried layer comprising the steps of:

a) oxidizing the top and bottom surfaces of an N+ device wafer;

b) bonding a handle wafer to said bottom oxide layer; and

c) removing said top oxide layer.

55. The method set forth in claim 54 further including the step of thinning said N+ device wafer.

56. A method for forming an N+ buried layer comprising the steps of:

a) providing a device wafer bonded to an oxide layer which, in turn, is bonded to a handle wafer;

b) implanting N type dopants into said device wafer across the entire top surface of said device wafer; and

c) diffusing said N type dopants into said device wafer.